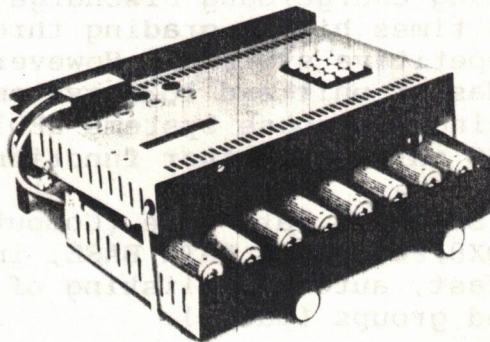


VICTOR ENGINEERING IQX8

8-CHANNEL MULTIPLEXER



FOREWORD

The IQX8 comes equipped with multi-function "PRO-RACER" software as standard equipment. As a member of Victor's "IQ" family, the IQX8 system is software upgradable and will NEVER BECOME OBSOLETE. We are currently working on several optional software packages which will be available in the near future.

"PRO-RACER" SOFTWARE

This software offers the most complete package of IQ functions needed for successful racing. The IQX8 system with PRO-RACER software will provide THREE modes of operation:

- 1) as a fully "loaded" non-multiplexed IQ unit with single output. You can use your Master IQ unit the same way as before. It is now loaded with the latest software functions.
- 2) as an 8-channel SINGLE CELL GRADING system using Gang Charge and Sequential Re-peak/Discharge techniques. This mode offers the most complete, accurate, and cost effective SINGLE CELL GRADING system currently available. The speed of grading with "PRO-RACER" software is somewhat slower than competitive systems, yet provides per-dollar-productivity approximately 1.6 times higher (3.8 times higher with the high-speed "PRO-MATCHER™" software- see below). Example: An IQX8 system costs typically $\frac{1}{2}$ of what competitive units cost. With the same amount of money invested, IQX8 systems process 1.6 times as many cells per hour with PRO-RACER software and 3.8 times as many with PRO-MATCHER software.
- 3) as a 7 channel PACK MULTIPLEXER for automatic sequencing of up to 7 packs, with all the HI-IQ pack conditioning or testing functions available in the SUPER-IQ except functions which require the Thermal Probe. Useful for charging/discharging at the track or for grading or cycling at home or the shop.

OPTIONAL SOFTWARE - to be released soon.

- 1) PRO-MATCHER™ HIGH-SPEED SINGLE CELL GRADING/MATCHING SOFTWARE for professional use where grading speed is important. The "stock" Gang Charge/Sequential Discharge grading cycle is replaced by a Gang Charge/Gang Discharge cycle. This will yield up to 3.8 times higher grading throughput per invested dollar than competitive systems. However, this requires more memory in the Master unit and IQX8 systems equipped with PRO-MATCH™ become single purpose systems DEDICATED TO SINGLE CELL GRADING/MATCHING only. No other functions can be installed.
- 2) TRACPAC-X8™ PC Software Data-Base (Computer Program) for a single IQX8/PC system DATA BASE, includes our exclusive IQ-MATCH™ for fast, automatic listing of cells in the best possible matched groups (packs).
- 3) MULTI-X8 PC software compliments the PRO-MATCHER™ package with automatic Multi-system management. Up to 24 IQX8 systems can be linked to a single PC for mass grading of up to 192 cells at a time and IQ-MATCHING™ from a virtually unlimited data-base of previously graded cells, yet the PC can be used for other work at the same time cell grading is in process. The IQ-MATCHING™ speed is more than 100 times faster than the manual process and much more accurate.

These optional software features are covered in more detail on separate data sheets.

INSTALLATION

NOTE: HI-IQ or HI-IQ SENIOR require a MEMORY EXPANSION MODULE (not supplied - available directly from Victor Engineering or your Hobby dealer for \$19.95). SUPER-IQ comes fully equipped.

IQX8 modules come ready to be installed. The Master IQ unit (HI-IQ, HI-IQ SENIOR, or SUPER-IQ) that the IQX8 will be connected to must be equipped with a new software EPROM chip (supplied), installed in the MEMORY EXPANSION MODULE (not supplied), and also correctly "STRAPPED" in order to permit the appropriate current limits. "Strapping" requires the installation of a single jumper wire between two points on the PC board of the Master unit. The HI-IQ (standard) does not require "strapping". Follow the steps below for complete IQX8 system set-up:

- 1) Remove the face plate from your Master IQ (loosen 2 screws on each side of the unit).
- 2) Remove the old EPROM chip from the socket located to the left of the keypad (pry up with a small, flat screwdriver, frequently switching from side to side).

- 3) If not previously installed, insert the Memory Expansion Module in the empty socket. (Not required with the SUPER-IQ, as it is already equipped with full memory). Line up all pins precisely with the holes and, with both index fingers placed under the PC board, apply pressure from the top using both thumbs. Do not press from the top only, as damage may occur to the PC board due to excess flexing.
- 4) Install the new EPROM chip into the Memory Expansion socket. Line up all pins with holes and carefully apply even pressure to both ends of the chip until it is fully inserted.
- 5) Install a jumper wire (may be of light gauge) between the following pins on the 50 pin connector marked H3 in the center of the PC board:

HI-IQ (STANDARD).....	no strapping
HI-IQ SENIOR	pins 40 and 25
SUPER-IQ	pins 16 and 25

Numbering starts from the top left pin 1 to pin 25 on the bottom left and continues on the top right from pin 26 to pin 50 on the bottom right. Make certain there are no shorts or solder splashes. Check visually, preferably with a magnifying glass (shorts may be microscopic), and use a stiff brush to clean the entire area. Do not "strap" lower IQ models like higher ones, since serious damage or malfunctions may occur.

- 6) Note the 4 screws located on the back wall of the Master unit. Remove the 2 lower screws closer to the heat sink end. Install the two angle brackets provided in these two places using the previously removed screws. Each bracket has one threaded hole and one non-threaded hole. The screws go through the non-threaded holes. The brackets must be oriented with the threaded sides pointed outward. Thread the thumb screws into the angle brackets. Do not tighten.
- 7) Find the 50 pin ribbon cable provided. It is folded over and creased. Do not straighten the crease, it serves a purpose. Connect the end marked "MASTER" to the 50 pin expansion connector on the back of the Master, with the red marking on the edge of the cable pointing toward the upper end of the Master unit (opposite end of the heat sink). Make certain the pins are not skewed and that the orientation is correct to prevent damage.
- 8) On the IQX8 (Multiplexer) remove the "L" shaped cover on the connector side of the unit to gain access to the 50 pin connector. The cover is held by one screw.
- 9) With the Master unit positioned on top of the Multiplexer, so the Multiplexer knobs are near the top of the Master, connect the other end of the 50 conductor ribbon cable to the IQX8 50 pin connector with the red marking along the edge of the cable pointing toward the pin "1" silkscreen designation on the PC board (near the fuse).

- 10) Replace the "L" shaped cover.
- 11) Replace the Master face plate. Tighten screws securely.
- 12) Remove the handle from the Master unit.
- 13) Insert the free ends of the Multiplexer swivel bar (the part resembling the HI-IQ handle) into the handle grommets on the Master. This couples the two units into a swiveling configuration. In one position (folded) the two units line up on top of each other with the cell holders "tucked in". In this position the shanks of the two loose threaded-in thumb screws should mate with the slots in the Multiplexer sides. The thumb screws can now be tightened to secure the system in the folded configuration. In the other position (unfolded - operational) the cell holders are exposed, ready for use. Angle brackets can be aligned so the system will swivel freely and the thumb screws will mate with slots without binding.
- 14) Insert the auxiliary black support bar (provided) into the bottom groove of the Master IQ heat sink with tabs pointing down. These tabs provide support when the Multiplexer is set-up for cell grading in the unfolded position. The support bar is pre-bent to provide sufficient tension for retention in the heat sink groove.
- 15) Plug the two-pin power connector from the IQX8 into the Master "MOTOR (-)" and "NI-CAD (-)" jacks as indicated on the connector decal.

The IQX8 system is now set up for operation.

OPERATION

Power up the system the same way you power up the HI-IQ unit. The display greets you as before except now it introduces itself as the "IQX8". After a configuration check it displays the usual Main Menu. Selections are the same as on the Master IQ.

A) NON-MULTIPLEXED IQ MODE

To use your system as a non-multiplexed IQ unit, unplug the two-pin power connector from the Master's Motor (-) and NI-CAD (-) jacks with power off and power-up the system. It will detect the change during the CONFIGURATION CHECK and will default to the NON-MULTIPLEXED mode. Battery and motor connections remain the same as before the IQX8 was connected. You do not have to disconnect the ribbon cable and may leave the system "folded". This mode offers all available IQ functions.

B) SINGLE CELL GRADING

NOTE: Braid contacts must be installed in the brass tube receptacles of all slots to be used. The braid should be bent over, facing the opposite side of the holder. Braided portions of adjacent contacts should not be touching, in order to maximize the accuracy of grading data. Worn out, frayed contacts should be replaced. Replacement contacts may be ordered directly from Victor Engineering @ \$.95 each (order part # VE-IQX8-CONT).

- 1) Insert the cells to be graded in the black cell cradles with positive electrodes pointing toward the knob side of the Multiplexer unit (see silkscreening on the PC board). Turn both knobs CCW to open the cell holders and CW to close them. After the cells have been inserted, tighten the knobs (CW) **simultaneously** until a significant drag is felt, indicating the cell holders tightening on the cells. Run a finger across the cells and tighten BOTH knobs some more if any of the cells turn loosely under your finger. Repeat as necessary until all cells are firmly held in the holders. **DO NOT OVERTIGHTEN!**
- 2) Power-up the system and wait for the Main Menu to appear on the display. Select SPECIAL FUNCTIONS (2), TESTS (1), MUX CELL GRADING (4) in this order.
- 3) The next menu gives a choice of 3 "pre-canned" grading cycles identified by the discharge current rate (10A, 20A or 30A - NOTE: 30A cycling is available only with the SUPER-IQ) and 1 CUSTOM cycle. Select any of the first 3, and the next menu SCE CELLS=1, SCR CELLS=2 appears. Select SCR ONLY FOR SANYO SCR1200. Select SCE for any other. This defines the defaults for charge current rate (4.0A for SCE choice, 8.0A for SCR choice) and Post Peak Drop (0.015V for SCE or 0.020V for SCR).

Other default parameters are:

PARAMETER	10A	20A	30A
Discharge cut-off.....	0.95V	0.85V	0.80V
Average voltage computation cut-off...	1.00V	1.00V	1.00V

If you select the CUSTOM cycle, the next menu RUN=1 EDIT/VIEW=2 appears. Select "1" to immediately execute the previously programmed CUSTOM cycle. Select "2" to program parameters for a new CUSTOM cycle, to edit, or just to view the old one.

- 4) the next display indicates the CELL DETECTION and detected cell numbers.
- 5) confirm the detection, or change it should you not want to test all connected cells, or if the detection did not come out correctly in case of completely "dead" cells. If any cell is installed backwards, it is detected and displayed. Correct the problem and select RETRY from the next menu.

6) The next step displays the automatically updated ID# (battery identification number). It can be confirmed as is, or a new one can be manually entered at this point. Confirmation can be done two ways - a) press "1" for OK b) press "3" for OK & ALTER PROCESS. Choice "2" gives the opportunity to change the ID#. If you select "3" you approved the ID# and the next display gives you a choice to:

- a) SKIP INITIAL DISCHARGE and go directly to GANG CHARGE.
- b) SKIP both and go directly to PEAK/FINAL DISCHARGE.

The grading process starts at this point.

7) When all slots have gone through a selected process, the final display prompts you to press a key corresponding to a slot # to display the data set for any individual slot. Press "0" to get back to the main menu. If you press "0" accidentally, there is a way to go back to the final data display. The last data set is preserved, as long as power remains on if the HI-IQ or HI-IQ SENIOR are used as a Master, and indefinitely with the SUPER-IQ, until the next process data set replaces it. You can access previous data from the Main Menu through SPECIAL FUNCTIONS / UTILITIES. For printing graphs or labels see the section on SERIAL PORT COMMUNICATION.

NOTE: You may get 3 different single cell data displays:

- a) actual valid data display
- b) SLOT UNUSED
- c) CELL USED AS A BOOSTER

The third display indicates the cell in this slot was used to prevent the final discharge current from rolling off at the end of the cycle. This can happen at high discharge rates when the voltage of the cell equals the voltage drop in the equipment, indicating a voltage potential too low to maintain the selected current rate.

Typically you may expect operation without booster "kick-in" under the following conditions:

MASTER UNIT	MAXIMUM DISCHARGE CURRENT ALLOWED	TYPICAL NO-BOOSTER OPERATION
HI-IQ STANDARD	15 A	below 12 A
HI-IQ SENIOR	20 A	usually OK @ 20 A
SUPER-IQ	30 A	below 26 A

Booster "kick-in" is automatic and fully controlled by the CPU. In case of excessive resistance in the cell holder, relay contacts, or bad connections in general, the processor may decide to use more than one booster at current rates close to the upper limit of the particular IQX8 configuration. The processor always picks the cell in the highest slot number for a booster. What do we do with the booster cells? Give them a 24 hour rest period and then grade them again. This time in a lower slot number to make sure they are not used as a booster again.

ACCORDING TO OUR RESEARCH, THE MOST REVEALING DISCHARGE TEST FOR SUB-C CELLS USED IN RC RACING IS AT A 25 OR 30 AMP RATE. Of the two, the 25 AMP rate is more realistic, less abusive to the cells, and more widely used than the 30 AMP rate.

AT 25 AMP USE 0.83 VOLT CUT-OFF UTILIZING THE "CUSTOM" CYCLE.

A 30 AMP DISCHARGE rate may be beneficial for cells used in "brute" current load applications, such as drag racing or tractor pulling. In these cases you may be testing for best average voltage only, since run time is immaterial.

VALUABLE HINTS FOR HIGH DISCHARGE CURRENT CELL GRADING:

- a) Maintain the cell holder contacts in the best possible condition. Replace braid contacts when worn. DO NOT FORCE CELLS IN OR OUT OF THE HOLDERS WHEN TIGHTENED. A contact set will give many uses if holders are properly loosened before inserting or removing cells.
- b) Although our braid contacts allow the use of cells with solder residue on the terminals, a heavy soldering iron may be used to remove excessive amounts with sufficient heat and subsequent suction or brushing. Terminals of all cells should be cleaned with a fine wire brush prior to grading, to rid them of resistive oxides, which form rather quickly and may not be visible.
- c) DO NOT REMOVE THE RELAY COVERS. Store the unit in a clean, dust free environment. Do not attempt to clean the relay contacts with any cleaning spray or any abrasive tool, fabric or cotton swabs. The contacts are pre-coated with a highly conductive silver-filled grease for minimum resistance and protection against corrosion.

C) MULTI-PACK feature

CAUTION: A MAXIMUM OF 7 PACKS CAN BE CONNECTED TO THE IQX8 MULTIPLEXER! CONNECTION OF 8 PACKS WILL INSTANTLY DAMAGE THE MASTER UNIT!

- 1) To connect up to 7 packs to the Multiplexer, you must unplug the REPLACEABLE BRAID CONTACTS from their brass receptacle tubes. You may need to use pliers to remove the braided part. Connect appropriate high current leads (plugs at one end, alligator clips at the other) into these tubes (optional wire sets are available from Victor Engineering for \$ 29.95 per set of 14 pairs). Connect the other ends to the packs. Observe polarity. It is marked on the multiplexer PC board. Tubes closest to the knobs are marked POSITIVE (positive power connection and positive voltage sensing connection).

It is the same on the opposite end of the slot, (+) power tubes oppose (-) power tubes and likewise with the sensor tubes. Sensor leads must be connected directly to the pack terminals with their own alligator clip for accuracy, mainly in the GRADING cycle.

- 2) To begin using the MULTI-PACK feature, continue the same way as with a non-Multiplexed unit. All the steps are the same, followed by a new one - USED SLOT DETECTION - which automatically detects slots with packs connected.
- 3) Confirm the detection; or change it should you not want to test all connected packs, or if the detection did not come out right in case of completely "dead" batteries. If any battery is connected backward, it is detected and displayed. Correct it and select RETRY from the next menu.
- 4) The selected process is now in progress on the first slot with the lowest number. It will automatically proceed through all detected and confirmed slots until they are processed.
- 5) When all slots have gone through the selected process, the final display prompts you to press a key corresponding to a slot # in order to display a data set for any individual slot. Press "0" to get back to the main menu. If you press "0" accidentally, during the grading process (only), there is a way to go back to the final grading data display. The last grading data set is preserved as long as the power remains on if the HI-IQ or HI-IQ SENIOR are used, and indefinitely with the SUPER-IQ, until the next grading data set replaces it. You can access previous grading data from the Main Menu through SPECIAL FUNCTIONS / UTILITIES. For printing graphs or labels see the section on SERIAL PORT COMMUNICATION. Label printing, as well as last data access from Utilities, are available only after FULL/TEST GRADING (in Special Functions, Test "2").

SERIAL PORT COMMUNICATION

(Label & graph printing, PC hook-up)

Victor Engineering products come equipped with RS-232 type serial ports to communicate with computers and printers. These ports provide full two-way communication, as opposed to Centronics type parallel ports used by other systems for one-way, printer-only interfacing. IQ systems can be connected not only to serial printers, but also to any type of terminal or computer for complete two-way networking. In this manner, IQ equipment not only "dumps" data out but also receives commands or other information from the host controller.

To print labels or graphs without a PC requires a serial printer or a parallel printer with a serial-to-parallel converter. The proper choice of cable(s) depends on the type of connector on your printer (9 or 25 pin). The IQX8 unit is equipped with two

female 25 pin connectors, type DB-25. Both ports can be connected to serial printers. The connector closest to the corner of the IQX8 unit prints real time graphs while the one closest to the center prints labels. They work independently of each other.

NOTE: USE A NULL MODEM cable or adaptor to connect a Serial-to-Parallel convertor (available at any computer store) should you use a parallel printer. DO NOT USE A NULL MODEM to connect directly to a serial printer!

Your serial printer or serial-to-parallel converter should be set as follows:

Baud rate 1200, 8 bit data + 1 stop bit, no parity, no echo.

LABEL PRINTING

Label printing is available AFTER Single Cell Grading and AFTER Multi-Pack Grading from the "MUX GRADING ENDED" menu. Once the label printing selection has been made another choice comes up: PRINT=1 EDIT=2. Choice "1" prints all 8 labels in one line. Choice "2" will be covered in the LABEL EDITING section.

Example of the label format:

.....LABEL.....MEANING.....
IQX8 070691001	070691001 = ID# (date, year, ser #)
3.8 .010 1845	chrg: 3.8amp, .010V PEAK DROP, 1845 sec,
1948 1	1948mAh Slot # 1
10.0 .95 489	dsch: 10.0Amp, .95V CUT-OFF, 489 sec.,
1356 1.16 8.0	1356mAh, 1.16V AVERAGE, 8.0mOhm IR

LABEL EDITING

If choice "2" (EDIT) is made in the above menu, the next display

.....TEXT.....

C:A Vdr s mAh
D:A V s mAh aV R

.....MEANING.....

C:= CHARGE, A=AMP, Vdr=PEAK DROP, mAh
D:= DISCHG., A=AMP, V=CUT-OFF V, s=sec, mAh, aV=avr.V, R=Int.Res.

gives the opportunity to omit any of these parameters, if more clarity and less data is required. To blank these, press "2".

The next display:

C:A Vdr s mAh

D:A V s mAh aV R with a blinking A in the top line

prompts you to either permit printing of the charging current by pressing "1", or to blank it out by pressing "2". Now the next parameter starts blinking and the process is repeated until all parameters have been covered.

WARRANTY

Victor Engineering warrants this unit to be free from factory defects in materials and workmanship for a period of 90 days from the date of purchase (verified by sales receipt). Victor Engineering will repair or replace (at our sole discretion) the unit, if any such defect should appear within the period of the warranty.

If a defect covered by the warranty should appear within this warranty period, return the unit, postage prepaid and insured to Victor Engineering Service. Enclose your name and address, a brief statement of the problem, and a copy of the sales receipt or other proof of purchase. It will be returned freight collect when repairs have been completed.

VICTOR ENGINEERING SERVICE
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This warranty is extended only to the original purchaser. This warranty only covers failures due to defects in materials or workmanship which occur during normal use. It does not cover damage which occurs in shipment or failures which result from accident, misuse, abuse, neglect, mishandling, misapplication, alteration, modification, or service by anyone other than Victor Engineering, or damage that is attributable to acts of God.

Limits and Exclusions

There are no express warranties except as listed above. VICTOR ENGINEERING SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT, OR ARISING OUT OF ANY BREACH OF THIS WARRANTY. ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE APPLICABLE WARRANTY PERIOD SET FORTH ABOVE.